‘Go Green on Lamma Island’ Programme Series

(1) Renewable Energy

Aims of the Programme:

- To promote a low carbon lifestyle in students, and to develop their knowledge, skills and positive values and attitudes that enable them to make well-informed decisions and take action for the creation of sustainable environment.

Students’ prior knowledge:

S3: - the types of renewable energy.
- the measures to conserve the environment in Hong Kong, and the sustainable farming methods.

S4: - the causes and effects of climate change and the related measures taken locally, nationally and globally to combat climate change.

S5: - the causes and impact of global warming and the strategies used to cope with global warming.

After the programme, students are able to:

- understand the causes and effects of greenhouse gases emission in Hong Kong.
- understand that developing renewable energy can be one of the ways to combat climate change but there are limitations.
- recognise the importance of having low carbon lifestyle.
- be willing to take action to combat climate change in their daily life.

Rundown:

10:00-10:25	Take H.K. Electric’s ferry
10:25-10:28	Reach Lamma Power Station and get on H.K. Electric’s vehicle
10:28-10:48	Tour and presentation given by H.K. Electric’s staff at Customer Service Centre
10:48-11:48	Get on H.K. Electric’s vehicle to Power Station for visiting solar power system & natural gas units; tour around the extension of the Power Station is mostly completed on the vehicle for safety reason
11:48-11:50	Get on H.K. Electric’s vehicle to Lamma Power Station Beach
11:50-12:20	Get off at Lamma Power Station Beach (Guided tour ends) and view Power Station at the beach
12:20-13:00	Lunch
13:00-13:20	Walk to Lamma Winds
13:20-14:20	Study the exhibition board and conduct a role play to discuss whether renewable energy should be further developed in Hong Kong
14:20-14:50	Walk to Yung Shue Wan Ferry Pier and have post-trip activities
15:15	Take ferry to Central (aboard at 15:15 at Yung Shue Wan Ferry Pier *)

*Weekdays/Weekend Schedule

‘Go Green on Lamma Island’ Programme Series (1) : Renewable Energy (Pre-trip Activities)		
Time	**Teaching strategy and content**	**Notes / Resources**
30 mins	**Pre-trip Activity:** 1. Teacher asks students to divide into groups. 2. Teacher asks students to complete the pre-trip activities. 3. Teacher consolidates the learning points of Q.1-3. 4. With regard to Q.3, teacher asks students to consider whether they will revise the measures they proposed to the government to combat climate change after the field trip. Teacher will follow up after the field trip. 5. Teacher briefs students about the questions that need to be addressed in the field trip and introduces the tasks to be done.	Students can go to the following website of NASA to explore the following: • Image of change of land: • Climate time machine (http://climate.nasa.gov/resources/education/)

Stop 1: Lamma Power Station

Objectives:

At the end of the activity, students should be able to:

- understand that the burning of fossil fuels for electricity is the largest source of greenhouse gas emissions from human activities.
- understand that the use of fuel mix alone cannot help minimise climate change.

Time	Teaching strategy and content
10:28 - 10:48 (20 mins)	Guided tour by HK Electric Company • Staff of HK Electric Company briefs students about the history and aims of building Lamma Power Station, and related information at the Customer Service Centre.
10:48 - 11: 48 (60 mins)	Guided tour to Lamma Power Station
11:48 - 11:50 (2 mins)	Get on H.K. Electric's vehicle to Lamma Power Station Beach
11:50 - 12:20 (30 mins)	1. Teacher asks students to view Lamma Power Station from Lamma Power Station Beach. 2. **Teacher's introduction**: Fossil fuels are formed over millions of years, from the remains of dead animals or plants. During photosynthesis, plants absorb carbon dioxide from the air to produce their own food. Carbon dioxide will be released back into the atmosphere through cellular respiration. Sometimes, plants or animals with carbon trapped in their body get buried before decaying. After millions of years, they turn into fossil fuels containing carbon under great heat and pressure. The carbon dioxide is then released back into the atmosphere through combustion. This leads to adverse climate change. (Teacher may consider this information optional if the staff of Hong Kong Electric Company has already given similar information to the students during the guided tour.) 3. Teacher guides students to complete Q.1 and asks them to complete Q.2-3. 4. Teacher consolidates the learning points. 5. Teacher asks students to complete Q.4-5. Teacher discusses with students on whether the use of natural gas can help combat climate change. Teacher may link these learning points to the greenhouse emissions reduction target agreed in the Paris Agreement. **Points to note:** • Teacher can visit the following website for booking a guided tour to Lamma Power Station: https://www.hkelectric.com/en/our-operations/electricity-generation/application-for-visit-to-hk-electric 6. **Teacher's conclusion:** • Carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are greenhouse

	gases (GHG). They trap heat in the atmosphere and intensify greenhouse effect, causing global warming. • The Earth is getting warmer because people are adding GHG to the atmosphere. In Hong Kong, electricity generation from the burning of fossil fuel is the biggest contributor to GHG emissions. The situation is getting worse due to rapid population and economic growth. • Hong Kong will continue to phase down coal for electricity generation, use more natural gas and increase non-fossil fuel sources. This will enable Hong Kong to reduce carbon emissions significantly in the medium term, representing a very major commitment. While the power companies as public utilities should strive to be energy efficient, it is always useful to emphasise the overall importance of not wasting energy for the benefit of the present and future generations and protecting the earth. (Source: https://www.climateready.gov.hk/files/report/en/HK_Climate_Action_Plan_2030+_booklet_En.pdf) (Teacher may consider this information optional if the staff of Hong Kong Electric Company has already given similar information to the students during the guided tour.)
12:20 - 13:20 (60 mins)	Lunch and walk to Lamma Winds

Stop 2: Lamma Winds

Objectives:

At the end of the activity, students should be able to:

- understand that the development of renewable energy is one of the ways to reduce carbon emission for combating climate change.
- recognise the advantages and disadvantages of different types of renewable energy.
- understand that climate change can be mitigated through saving energy.

Time	Teaching strategy and content
13:20 -14:20 (60 mins)	1. Teacher guides students to visit Lamma Winds. 2. **Teacher's introduction:** • This is the Hong Kong's first wind turbine. It began operating on 23 Feb 2006. Teacher may encourage students who have visited wind farm(s) of other region(s) to share their experience. 3. Teacher may introduce the environmental initiatives incorporated into the station design. For example, furnace bottom ash, one of the major solid by-products of burning coal and a rich source of nutrients for plant life, has been used to plant shrubs and trees. Also, pulverised fuel ash was mixed with concrete to make paving blocks for the station. Precast concrete pipes were recycled and used as stands for display boards, while solar-powered luminaries have been installed for lighting purposes. Reference: https://www.hkelectric.com/en/MediaResources/Documents/LammaWinds.pdf 4. Teacher asks students to complete Q.1-8 in groups. For Q.6, the role and the task of each group should be briefed in advance. After students complete their presentation of Q.6, teacher may draw students' attention to the fact that different parties in the community may have different views on the development of renewable energy. For Q.7, teacher may ask students to line up in two rows (agree vs disagree). Each student of each row take turns to give one reason to support their view. 5. Teacher consolidates the learning points. **Points to note:** • Lamma Winds is occasionally closed for maintenance. Please contact HK Electric (Tel: 2843 3209) in advance to ensure that it is open on the date of the field trip. Opening hours: 7am-6pm (daily) • In order to show that there is a positive relationship between wind speed and power output, teacher may record the data in Q.3 in advance by visiting HK Electric's website below. Please note that the units shown in the website are different from those shown at the tower base of the wind turbine. https://www.hkelectric.com/en/our-operations/lamma-wind-power-station/real-time-operation

	• Guided visits to Lamma Power Station and Lamma Winds can be arranged through HK Electric. The visit to both sites will take about 3 hours respectively. Teacher can browse the following website for more information: https://www.hkelectric.com/en/our-operations/electricity-generation/application-for-visit-to-hk-electric 6. **Teacher's conclusion:** • Although fuel mix can produce less carbon dioxide during energy generation, it is not the most effective way to combat climate change. Wind turbine seems not workable in Hong Kong, whereas it is successfully developed and operated in some countries such as Scotland. The wind farm in Scotland meets over half of Scotland's electricity needs. Under strong wind, its production can fulfill all of electricity needs for a day. • Our behaviour, decision and choice of lifestyle affect the demand and the supply of electricity and in turn the amount of carbon emissions. To combat climate change, we can reduce energy consumption and improve energy efficiency, such as using energy-saving bulbs and energy-efficient appliances at home (Grade 1 products are most efficient). In addition, changing the way of travelling is also an effective way of reducing carbon emission. In conclusion, adopting low-carbon lifestyle will reduce GHG emission.
14:20 - 14:50 (30 mins)	Walk to Yung Shue Wan Ferry Pier and have post-trip activities
15:15	Take ferry to Central (Aboard at 15:15)